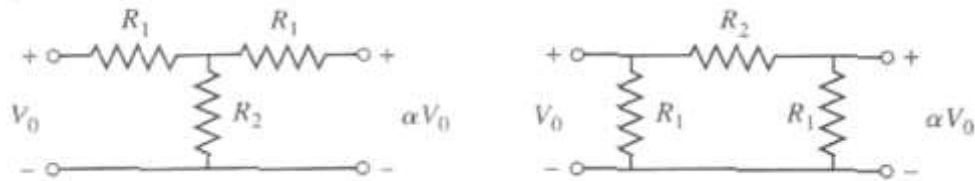
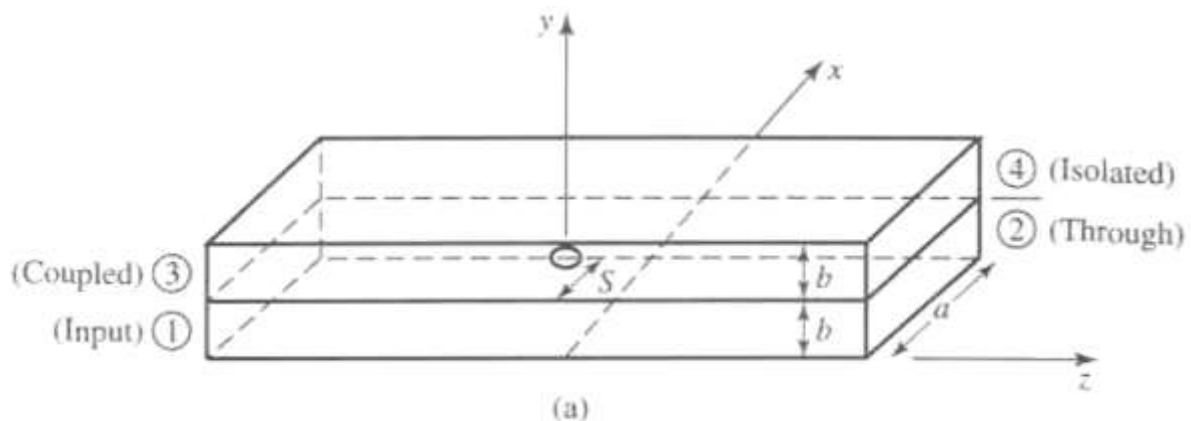


MWave Sheet 5

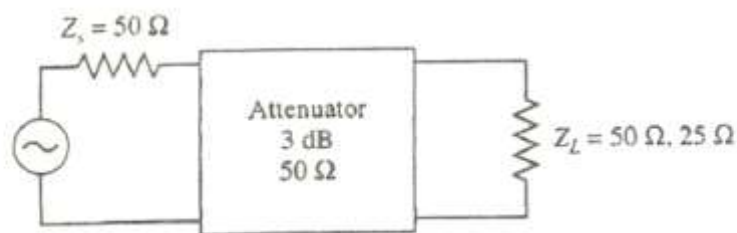
- (1)
(7-6) Consider the T and π resistive attenuator circuits shown on the next page. If the input and output are matched to Z_0 , and the ratio of output voltage to input voltage is α , derive the design equations for R_1 and R_2 for each circuit. If $Z_0 = 50\ \Omega$, compute R_1 and R_2 for 3 dB, 10 dB, and 20 dB attenuators of each type.



- (2)
(7-12) Design a Bethe hole coupler of the type shown in Figure 7.16a for Ku-band waveguide operating at 11 GHz. The required coupling is 20 dB.



- (3)
(11-1) Consider the microwave network shown below, consisting of a $50\ \Omega$ source, a $50\ \Omega$, 3 dB matched attenuator, and a $50\ \Omega$ load. (a) Compute the available power gain, the transducer power gain, and the actual power gain. (b) How do these gains change if the load is changed to $25\ \Omega$? (c) How do these gains change if the source impedance is changed to $25\ \Omega$?



- (4)
(11-2) An amplifier uses a transistor having the following S parameters ($Z_0 = 50\ \Omega$): $S_{11} = 0.61 \angle -170^\circ$, $S_{12} = 0.06 \angle 70^\circ$, $S_{21} = 2.3 \angle 80^\circ$, $S_{22} = 0.72 \angle -25^\circ$. The input of the transistor is connected to a source with $V_s = 2\ \text{V}$ (peak) and $Z_s = 25\ \Omega$, and the output of the transistor is connected to a load of $Z_L = 100\ \Omega$. (a) What is the power gain, the available gain, the transducer power gain, and the unilateral transducer power gain? (b) Compute the available power from the source, and the power delivered to the load.